

Research Note

Metazoan Parasites of the Graybelly Salamander, *Eurycea multiplicata griseogaster* (Caudata: Plethodontidae), from Arkansas

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ABSTRACT: Fifty graybelly salamanders, *Eurycea multiplicata griseogaster* Moore and Hughes, 1941, were collected between December 1988 and 1993 from 7 counties of Arkansas and examined for metazoan parasites. Seven (14%) were infected with 1 or more parasites, including 1 (2%) with *Brachycoelium salamandrae* (Frölich, 1789) Dujardin, 1845, 3 (6%) with *Desmognathinema nantahalaensis* Baker, Goater, and Esch, 1987, 2 (4%) with *Fessisentis vancleavei* (Moore and Hughes, 1943) Nickol, 1972, and 2 (4%) with larval *Hannemania* sp. Oudemans, 1911. New host and distributional records are reported for some of these parasites of *E. multiplicata griseogaster*. In addition, the cave salamander, *Eurycea lucifuga* Rafinesque, 1822, is documented as a new host for *D. nantahalaensis*.

KEY WORDS: *Eurycea multiplicata griseogaster*, graybelly salamander, *Eurycea lucifuga*, cave salamander, Amphibia, Caudata, Plethodontidae, *Brachycoelium salamandrae*, *Desmognathinema nantahalaensis*, *Fessisentis vancleavei*, *Hannemania* sp.

The graybelly salamander, *Eurycea multiplicata griseogaster* Moore and Hughes, 1941, is a small plethodontid that ranges from southcentral Missouri and extreme southwestern Kansas to adjacent Arkansas and westward to northeastern Oklahoma (Conant and Collins, 1991). This salamander inhabits cave-fed springs and cool Ozarkian streams where it hides beneath rocks, logs, and debris in seepage areas. The biology of *E. multiplicata griseogaster* was summarized in a species account by Dundee (1965) and Ireland (1970, 1976) reported on the natural history and ecology of this salamander in Arkansas. However, little is known about its helminth parasites (Malewitz, 1956; Buckner and Nickol, 1978; McAllister et al., 1991), and some data are only available from unpublished theses (Bouchard, 1953; Fogle, 1960; Saltarelli, 1977). This note reports some new host and locality records for metazoan parasites of *E. multiplicata griseogaster* from Arkansas.

Fifty larval, neotenic, and adult ($\bar{x} \pm \text{SE}$ snout-vent length [SVL] = 45.5 ± 1.1 , range 35–55 mm) graybelly salamanders were collected alive by dipnet or hand between December 1988 and December 1993 from the following counties (sample sizes in parentheses): Conway (11), Franklin (2), Jackson (2), Pope (9), Van Buren (4), Washington (20), and White (2) counties of Arkansas. Salamanders were considered sexually mature at SVL's of ≥ 37 mm (Ireland, 1976). They were kept moist and cool in plastic collecting bags on ice and returned to the laboratory within 24 hr. Salamanders were sacrificed by overdose with an aqueous solution of tricaine methanesulfonate (TMS-222). Methods for salamander processing and preparation and staining of parasites follow McAllister and Upton (1987). Voucher specimens of salamanders are deposited in the Arkansas State University Museum of Zoology (ASUMZ 19223–19238, 19242–19253). Specimens of parasites are deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705, as follows: *Brachycoelium salamandrae* (USNM 83520), *Desmognathinema nantahalaensis* (USNM 83522–83524), *Fessisentis vancleavei* (USNM 83519), and *Hannemania* sp. (USNM 83521).

Seven (14%) of the *E. multiplicata griseogaster* harbored metazoan parasites, including 1 (2%) with *Brachycoelium salamandrae* (Frölich, 1789) Dujardin, 1845, 3 (6%) with *Desmognathinema nantahalaensis* Baker, Goater, and Esch, 1987, 2 (4%) with *Fessisentis vancleavei* (Moore and Hughes, 1943) Nickol, 1972, and 2 (4%) with larval *Hannemania* sp. Oudemans, 1911. Of the 7 infected salamanders, only 1 (14%) was multiply infected. In addition, none of the *E. multiplicata griseogaster* were found to be passing coccidian oocysts in the feces, and the blood was

negative for intraerythrocytic hematozoans or trypanosomes.

The single specimen of the plagiorchid trematode, *Brachycoelium salamandrae*, was found in the small intestine of an adult female *E. multiplicata griseogaster* (SVL 47 mm, ASUMZ 19247) collected from a stream north of Morrilton, Conway County. This represents a new host record for *B. salamandrae*. Winter et al. (1986) reported *B. storeriae* Harwood, 1932, from the Caddo Mountain salamander, *Plethodon caddoensis* and the Fourche Mountain salamander, *P. fourchensis* in Arkansas. In addition, Rosen and Manis (1976) reported *B. ambystomae* Couch, 1966, and *B. elongatum* Cheng, 1958, from the spotted salamander, *Ambystoma maculatum*, and the Ouachita dusky salamander, *Desmognathus brimleyorum*, in Arkansas, respectively. Other *Eurycea* spp. have been reported as hosts of *B. salamandrae*, including the northern 2-lined salamander, *E. bislineata*, from New York (Fischthal, 1955a), Pennsylvania (Fischthal, 1955b), Massachusetts (Rankin, 1945), and North Carolina (Mann, 1932; Rankin, 1937), the longtail salamander, *E. longicauda*, from Illinois (Landewe, 1963) and North Carolina (Mann, 1932; Rankin, 1937), and the cave salamander, *E. lucifuga*, from Kentucky (Castle et al., 1987) and Illinois (Landewe, 1963). However, because of difficulty in determining specific identity due to morphological variation and the crowding effect, Dyer and Brandon (1973) and Dyer and Peck (1975) have reported *Brachycoelium* sp. from *E. lucifuga* in Illinois and Alabama and Tennessee, respectively.

Brachycoelium spp. are the most common flukes encountered in salamanders (Dyer, 1983). However, the continual recognition of numerous species of *Brachycoelium* (Parker, 1941; Cheng, 1958; Cheng and Chase, 1961; Couch, 1966; Dunbar and Moore, 1979; Sellers et al., 1981) or a single species, *B. salamandrae* (Rankin, 1938; Rabalais, 1970), for North American salamanders is not without controversy (see Dyer and Brandon, 1973). Until an exhaustive revision of this morphologically variable genus is complete, we suggest adopting a conservative approach and report only *B. salamandrae* in North American salamanders.

Thirty-five specimens of the seuratoid nematode, *Desmognathinema nantahalaensis*, were found in the small intestine of 3 salamanders, including a larva (35 mm SVL) with 15 specimens and an adult (47 mm SVL) with 10 spec-

imens from the Morrilton site and a neotene (45 mm SVL) with 10 specimens from Savoy Cave, Washington County. In addition, we recently found 5 *D. nantahalaensis* in another host, a single larval cave salamander, *Eurycea lucifuga* (SVL = 30 mm, ASUMZ 19192), from a stream outside of Blowing/Cushman Cave, Independence County, Arkansas (unpubl. obs.). Baker et al. (1987) originally described *D. nantahalaensis* from the blackbelly salamander, *Desmognathus quadramaculatus* (type host), and seal salamander, *D. monticola*, from North Carolina. Interestingly, sympatric species of *Desmognathus* are not present in habitats where the infected graybelly salamanders were collected. Further, it is not known why there appears to be an apparent disjunct pattern in distribution of this parasite, but it could be explained by lack of survey data for salamanders from other regions of North America. *Eurycea lucifuga* and *E. multiplicata griseogaster* are new hosts and Arkansas a new locality for *D. nantahalaensis*.

Fifteen specimens of the acanthocephalan, *Fessisentis vancleavei*, were found in the small intestine of 2 adult salamanders (41 mm SVL, 5 specimens, ASUMZ 19244; 47 mm SVL, 10 specimens, ASUMZ 19245) collected from Van Buren County. Hughes and Moore (1943) originally described *F. vancleavei* from the Oklahoma salamander, *Eurycea tynnerensis*, in Cherokee County, Oklahoma. Later, *F. vancleavei* was reported in *E. multiplicata griseogaster* from Cherokee County, Oklahoma (Malewitz, 1956), and Madison and Benton counties, Arkansas (Saltarelli, 1977; Buckner and Nickol, 1978) and in the dark-sided salamander, *E. longicauda melanopleura* (Cope, 1893), from Benton County (Saltarelli, 1977). Fogle (1960), in an unpublished thesis, reported an unknown "acanthocephalan" from *E. multiplicata griseogaster* in northwestern Arkansas. However, since voucher specimens were apparently not deposited, it is unknown whether this acanthocephalan was *F. vancleavei* or another taxon.

Larval intradermal mites, *Hannemania* sp., infested 2 adult salamanders (43 and 46 mm SVL) collected from Petit Jean State Park and the Morrilton site, Conway County. Unengorged and partially engorged larvae were encapsulated on the neck, appendages, and toes by host dermal connective tissue. Specific identity was not possible since only larvae were found. The graybelly salamander is a new host of *Hannemania* sp.

Hannemania dunni Sambon, 1928, has been

reported from Rich Mountain salamanders, *P. ouachitae*, southern redback salamanders, *P. serratus*, *P. caddoensis*, *P. fourchensis*, and *D. brimleyorum* in Arkansas (Dunn and Heinze, 1933; Pope and Pope, 1951; Duncan and Highton, 1979; Winter et al., 1986). Indeed, at least 2 additional species of *Hannemania*, namely, *H. eltoni* Sambon, 1928, and *H. multifemorala* Loomis, 1956, are known from Arkansas amphibians (see Loomis, 1956).

In summary, metazoan parasites of *E. multiplicata griseogaster* appear to be typical of helminths from other plethodontid salamanders (Rankin, 1937; Goater et al., 1987; Aho, 1990) and exhibit little or no host specificity. Interestingly, Saltarelli (1977) reported an unknown species of *Paraquimperia* Baylis, 1934, from *E. multiplicata griseogaster*. However, this identification is doubtful and most probably represents *D. nantahalaensis* (reported herein), a related species in the subfamily Quimperinae Gendré, 1828. Members of the genus *Paraquimperia* are mainly parasitic in eels and have not been reported previously from amphibians (see Moravec, 1967).

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